# AMENDMENTS TO CLAIMS

Claim 1 (currently amended): A configurable integrated optical gate matrix comprising:

a set of nonlinear elements in which a first subset of the set of nonlinear elements is configured to function as a set of ON/OFF switches in the "OFF" state to enable a second subset of the set of nonlinear elements to be configured in at least one optical processing configuration, the at least one optical processing configuration comprising at least one of the following configurations: a configuration for all-optical 2R regeneration for re-amplifying and reshaping a data pulse; a configuration for all-optical 3R regeneration for re-amplifying, reshaping and re-timing a data pulse; a configuration for wavelength conversion; a configuration for data format conversion; a configuration for demultiplexing; a configuration for clock recovery; a configuration for a logic operation; and a configuration for dispersion compensation; and

a plurality of waveguides interconnecting at least some nonlinear elements in said set of nonlinear elements.

Claim 2 (original): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements is arranged essentially in a parallelogram matrix or a plurality of parallelogram matrices.

Claim 3 (original): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements comprises nonlinear elements based on at least one of the following: semiconductor optical amplifiers (SOAs); waveguide devices; and electro-optic nonlinear materials.

Claim 4 (canceled)

Claim 5 (original): The optical gate matrix according to claim 1 and wherein said at least one optical processing configuration is implemented by at least one of the following configurations:

at least one interferometric configuration;

at least one configuration that enables cross gain modulation (XGM);

at least one configuration that enables four-wave mixing (FWM); and

a combination of at least two of the following: at least one interferometric configuration; at least one configuration that enables XGM; and at least one configuration that enables FWM.

Claim 6 (original): The optical gate matrix according to claim 5 and wherein said at least one interferometric configuration comprises at least one of the following: a Mach Zehnder interferometric (MZI) configuration; a Michelson interferometric (MI) configuration; and a delayed interference configuration.

Claim 7 (previously presented): The optical gate matrix according to claim 1 and wherein said second subset of said set of nonlinear elements comprises a first nonlinear element inter-configuration outputting a first output signal in a first direction, and a second nonlinear element inter-configuration outputting a second output signal in a second direction, the second direction being essentially opposite to the first direction.

Claim 8 (original): The optical gate matrix according to claim 1 and also comprising a controller and driver interface operatively associated with the set of nonlinear elements and operative to provide an interface to a controller and driver for enabling programmable selection by the controller and driver of at least one of the following: a number of nonlinear elements in the first subset; a number of nonlinear elements in the second subset; a distribution of the nonlinear elements in the first subset; and a distribution of the nonlinear elements in the second subset.

Claim 9 (original): The optical gate matrix according to claim 1 and also comprising input/output (I/O) ports operative to direct light into and/or out of at least some nonlinear elements in said set of nonlinear elements.

Claim 10 (original): The optical gate matrix according to claim 1 and also comprising optical filters operative to direct light at selective wavelengths into and/or out of at least some nonlinear elements in said set of nonlinear elements.

Claim 11 (original): An optical processing unit (OPU) comprising the configurable integrated optical gate matrix of claim 1.

Claim 12 (currently amended): A photonic device for selectively performing on an input optical signal an optical processing operation and a switching operation, the photonic device comprising:

a first nonlinear element; and

a set of nonlinear elements comprising a second nonlinear element and not comprising the first nonlinear element, the set of nonlinear elements being configured in an optical processing configuration <u>which comprises at least one of the following configurations: a configuration for all-optical 2R regeneration for re-amplifying and reshaping a data pulse; a configuration for all-optical 3R regeneration for re-amplifying, reshaping and re-timing a data pulse; a configuration for wavelength conversion; a configuration for data format conversion; a configuration for demultiplexing; a configuration for clock recovery; a configuration for a logic operation; and a configuration for dispersion compensation</u>, wherein

the photonic device is controlled to enable performance of the optical processing operation on the input optical signal by the set of nonlinear elements to output an optical processing result to a first output route when the second nonlinear element is turned to an "ON" state and the first nonlinear element is turned to an "OFF" state, and to switch the input optical signal to a second output route by turning the first nonlinear element to an "ON" state when the second nonlinear element is turned to an "OFF" state.

Claim 13 (original): The photonic device according to claim 12 and wherein said optical processing operation comprises at least one of the following: all-optical 2R regeneration; all-optical 3R regeneration; wavelength conversion; data format conversion; demultiplexing; clock recovery; a logic operation; and dispersion compensation.

Claim 14 (original): The photonic device according to claim 12 and wherein each of the first nonlinear element, the second nonlinear element and the set of nonlinear elements comprises a nonlinear element based on at least one of the following: SOAs; waveguide devices; and electro-optic nonlinear materials.

Claims 15 - 25 (canceled)

Claim 26 (currently amended): A method for configuring a configurable integrated optical gate matrix that comprises a set of nonlinear elements, the method comprising:

configuring a first subset of the set of nonlinear elements to function as a set of ON/OFF switches in the "OFF" state to enable a second subset of the set of nonlinear elements to be configured in at least one optical processing configuration, the at least one optical processing configuration comprising at least one of the following configurations: a configuration for all-optical 2R regeneration for re-amplifying and reshaping a data pulse; a configuration for all-optical 3R regeneration for re-amplifying, reshaping and re-timing a data pulse; a configuration for wavelength conversion; a configuration for data format conversion; a configuration for demultiplexing; a configuration for clock recovery; a configuration for a logic operation; and a configuration for dispersion compensation.

Claim 27 (previously presented): The method according to claim 26 and also comprising configuring the second subset of the set of nonlinear elements in the at least one optical processing configuration.

Claim 28 (previously presented): The method according to claim 26 and also comprising programmably selecting at least one of the following: a number of nonlinear elements in the first subset; a number of nonlinear elements in the second subset; a distribution of the nonlinear elements in the first subset; and a distribution of the nonlinear elements in the second subset.

Claim 29 (canceled)

Claim 30 (currently amended): A method for selectively performing on an input optical signal an optical processing operation and a switching operation, the method comprising:

providing a first nonlinear element, and a set of nonlinear elements comprising a second nonlinear element and not comprising the first nonlinear element;

configuring the set of nonlinear elements in an optical processing configuration <u>which comprises at least one of the following configurations: a configuration for all-optical 2R regeneration for re-amplifying and reshaping a data pulse; a configuration for all-optical 3R regeneration for re-amplifying, reshaping and re-timing a data pulse; a configuration for wavelength conversion; a configuration for data format conversion; a configuration for demultiplexing; a configuration for clock recovery; a configuration for a logic operation; and a configuration for dispersion compensation</u>; and

enabling performance of the optical processing operation on the input optical signal by the set of nonlinear elements to output an optical processing result to a first output route when the second nonlinear element is turned to an "ON" state and the first nonlinear element is turned to an "OFF" state, and switching the input optical signal to a second output route by turning the first nonlinear element to an "ON" state when the second nonlinear element is turned to an "OFF" state.

Claim 31 (original): The method according to claim 30 and wherein said optical processing operation comprises at least one of the following: all-optical 2R regeneration; all-optical 3R regeneration; wavelength conversion; data format conversion; demultiplexing; clock recovery; a logic operation; and dispersion compensation.

Claims 32 - 36 (canceled)

Claim 37 (currently amended): A configurable integrated optical gate matrix comprising:

a first subset of a set of nonlinear elements, the first subset being configured in a configuration for functioning as a set of ON/OFF switches in the "OFF" state; and

a second subset of the set of nonlinear elements, the second subset being configured in at least one optical processing configuration enabled by the configuration of the first subset, the at least one optical processing configuration comprising at least one of the following configurations: a configuration for all-optical 2R regeneration for re-amplifying and reshaping a data pulse; a configuration for all-optical 3R regeneration for re-amplifying, reshaping and re-timing a data pulse; a configuration for wavelength conversion; a configuration for data format conversion; a configuration for demultiplexing; a configuration for clock recovery; a configuration for a logic operation; and a configuration for dispersion compensation.

Claim 38 (previously presented): The optical gate matrix according to claim 37 and wherein the first subset at least one of separates and isolates inter-configurations of the second subset.

Claim 39 (previously presented): The optical gate matrix according to claim 37 and wherein the at least one optical processing configuration comprises inter-configurations for performing at least one of the following: identical optical processing operations; and different optical processing operations.

Claim 40 (previously presented): The optical gate matrix according to claim 37 and wherein the at least one optical processing configuration comprises inter-configurations usable in a cascaded form for performing more than one optical processing operation on an inputted optical signal.

Claim 41 (previously presented): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements is arranged essentially in a rectangular arrangement.

Claim 42 (previously presented): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements is confined in a rectangle and at least some nonlinear elements in said set of nonlinear elements are horizontally tilted with respect to the rectangle sides.

Claim 43 (previously presented): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements is arranged essentially in parallelogram matrices, at least two of the parallelogram matrices being isolated from each other.

Claim 44 (previously presented): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements is arranged essentially in parallelogram matrices, at least two of the parallelogram matrices comprising an identical number of nonlinear elements.

Claim 45 (previously presented): The optical gate matrix according to claim 1 and wherein said set of nonlinear elements is arranged essentially in parallelogram matrices, at least two of the parallelogram matrices comprising a different number of nonlinear elements.

Claim 46 (previously presented): The optical gate matrix according to claim 1 and wherein the first subset at least one of separates and isolates inter-configurations of the second subset.

Claim 47 (previously presented): The photonic device according to claim 12 and wherein the first output route and the second output route are spatially separated from each other.

Claim 48 (previously presented): The photonic device according to claim 12 and wherein the first output route and the second output route are directionally separated from each other.

Claim 49 (previously presented): The method according to claim 26 and wherein said configuring comprises configuring the first subset to include nonlinear elements in a parallelogram row.

Claim 50 (previously presented): The method according to claim 26 and wherein said configuring comprises configuring the first subset to include nonlinear elements in a slant row of a parallelogram.

Claim 51 (previously presented): The method according to claim 26 and wherein said configuring comprises configuring the first subset to include nonlinear elements in a parallelogram row separating parallelogram rows including nonlinear elements of the second subset.

Claim 52 (previously presented): The method according to claim 26 and also comprising configuring the second subset in inter-configurations usable in a cascaded form for performing more than one optical processing operation on an inputted optical signal.